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Wilson

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(54) **DEVICE FOR SECURING A PORTION OF A SHEET OF FLEXIBLE MATERIAL AND AN ITEM OF PET FURNITURE INCORPORATING THE DEVICE**

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(51) **Int. Cl.**

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A01K 1/035	(2006.01)
F16B 5/06	(2006.01)
F16M 13/02	(2006.01)

(52) **U.S. Cl.**
CPC ***A01K 1/035*** (2013.01); ***F16B 5/0614*** (2013.01); ***F16B 5/0692*** (2013.01); ***F16M 13/02*** (2013.01)

(58) **Field of Classification Search**
CPC A01K 1/035; F16B 5/0614; F16B 5/0692; F16M 13/02; A47F 5/08; A47F 5/16; A47F 5/0884
See application file for complete search history.

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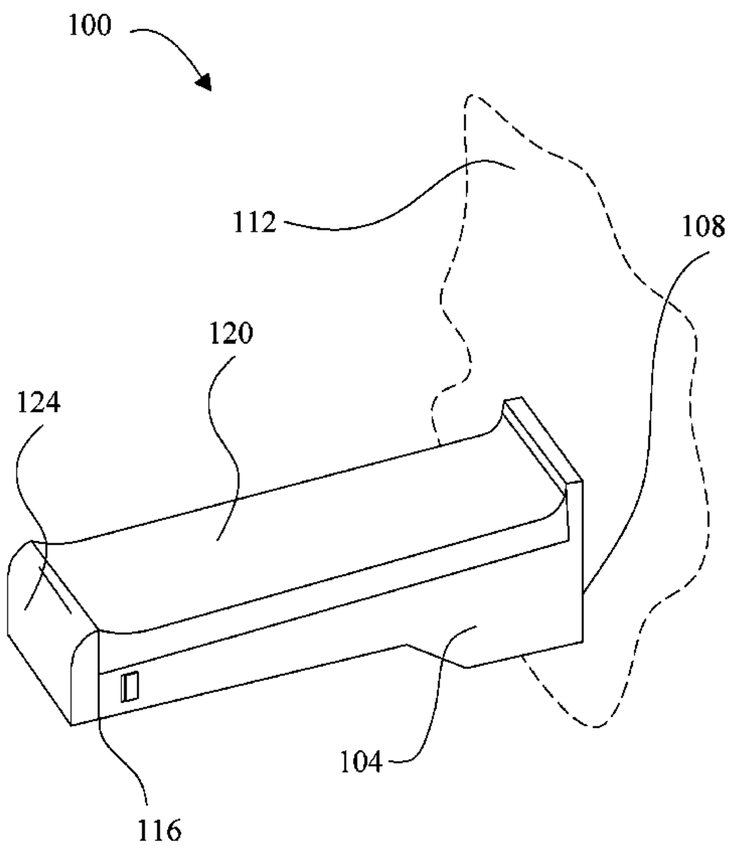
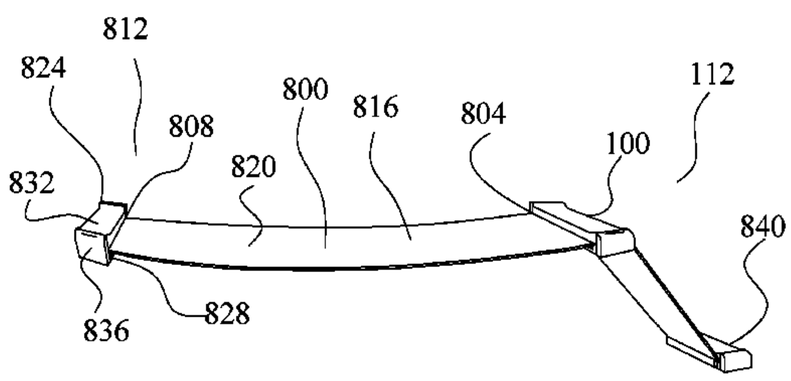
(74) *Attorney, Agent, or Firm* — Caldwell Intellectual Property Law

(57) **ABSTRACT**

A device for securing a portion of a sheet of flexible material includes a first clamping element having a proximal end mounted to a first substantially vertical surface, a distal end, a first clamping surface orthogonal to the first substantially vertical surface, and a first opposite surface opposite to the first clamping surface. The device includes a second clamping element having a second clamping surface fitted against the first clamping surface and a second opposite surface opposite to the clamping surface. The device includes a securing element that, when engaged, forces the second clamping surface to exert pressure against the first clamping surface. In an embodiment, a portion of a sheet of flexible material placed between the first clamping surface and the second clamping surface prior to securing the securing element is held there by the pressure exerted against the first clamping surface by the second clamping surface.

19 Claims, 8 Drawing Sheets





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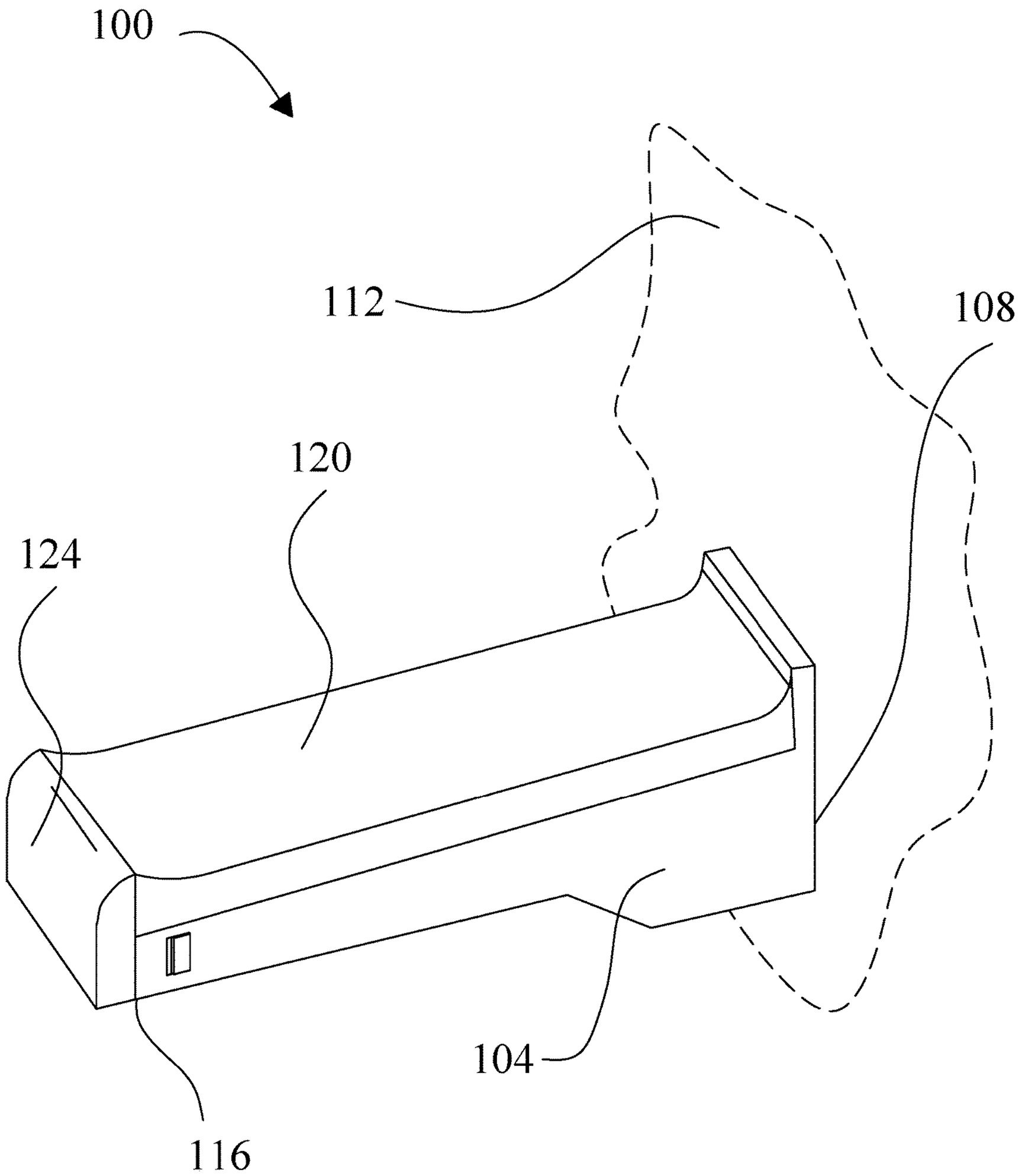

FIG. 1

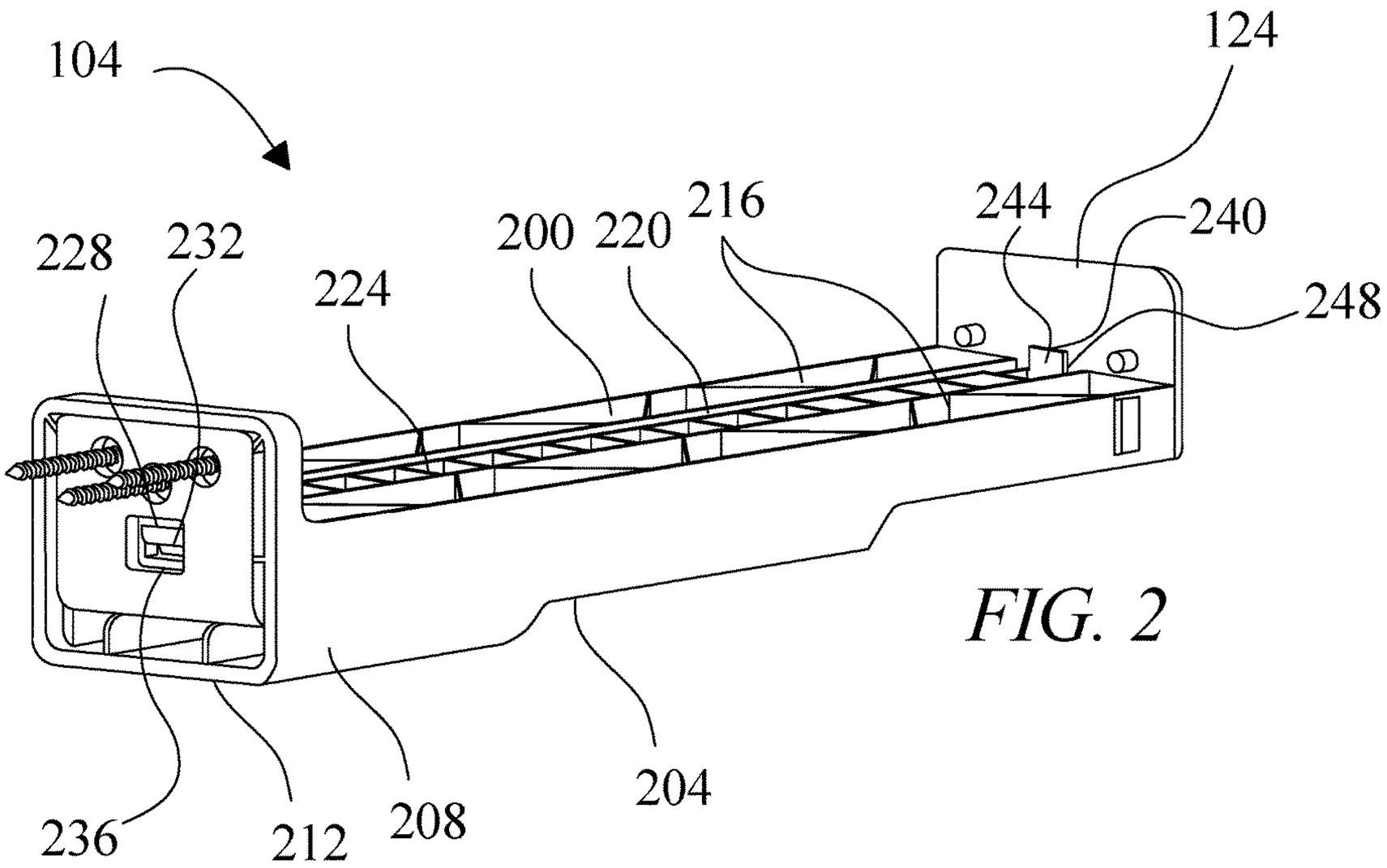
104
228
232
224
200
220
216
244
124
240
248
236
212
208
204

FIG. 2

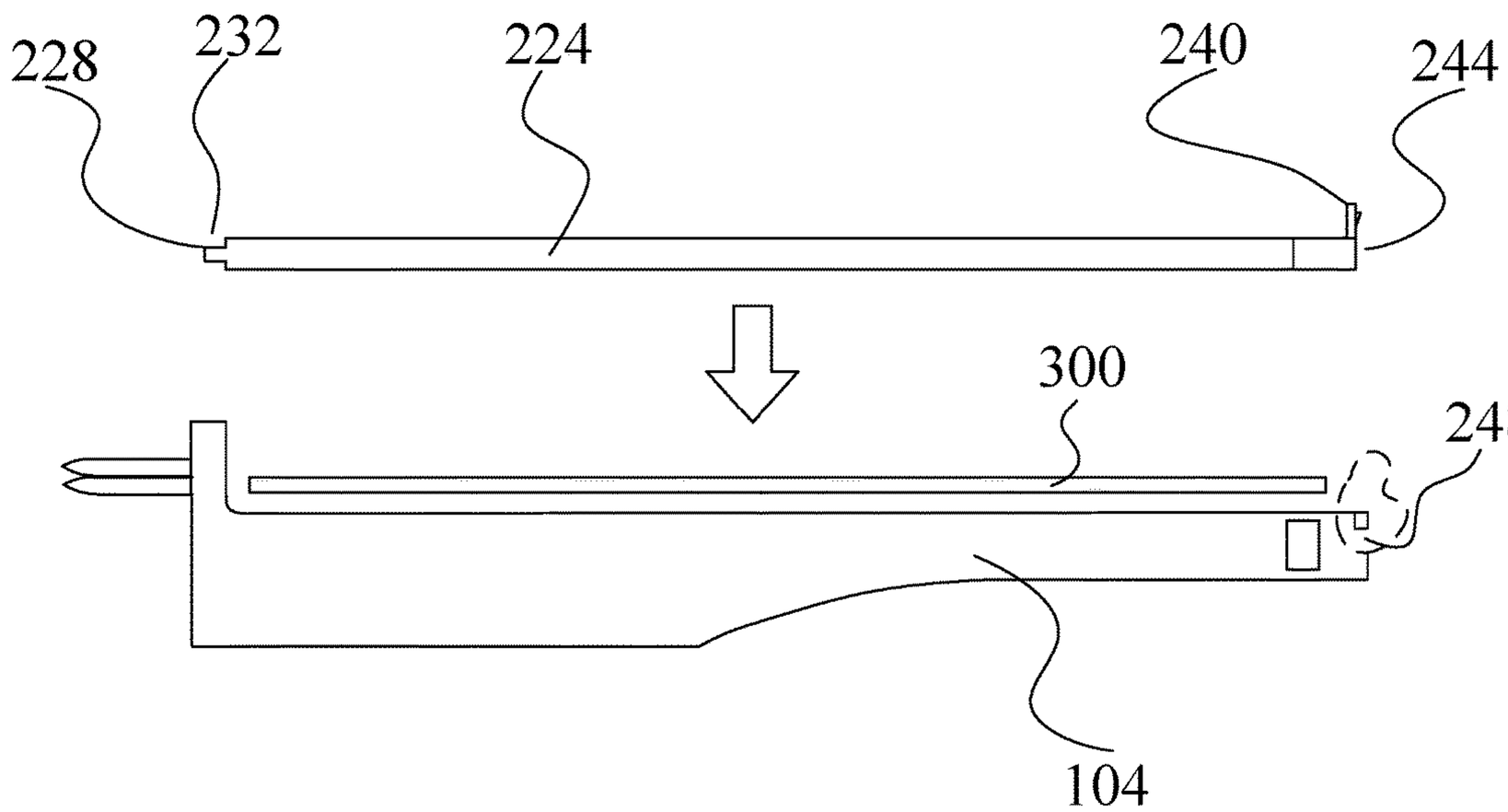
228
232
224
240
244
300
248
104

FIG. 3A

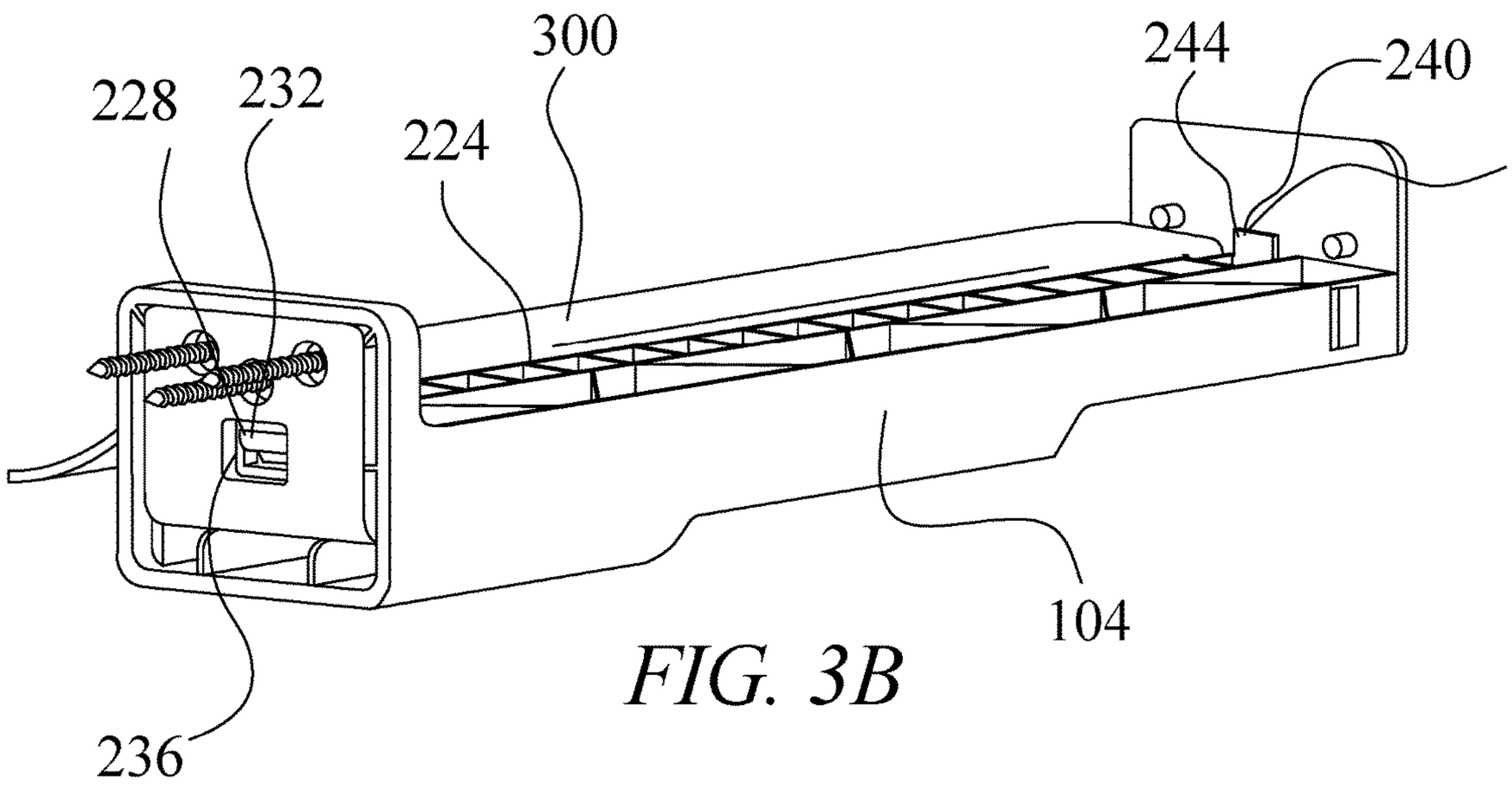

FIG. 3B

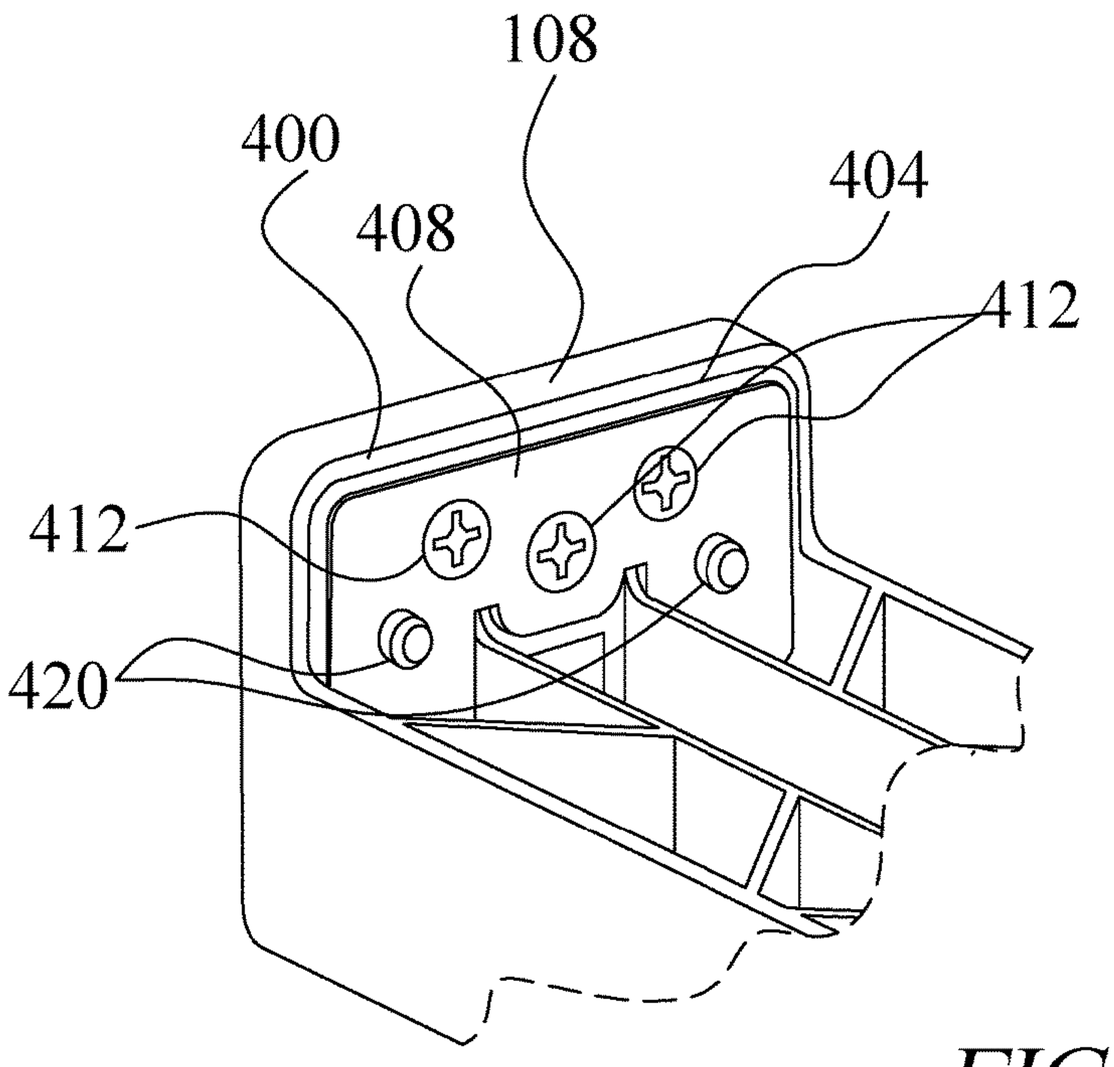

FIG. 4A

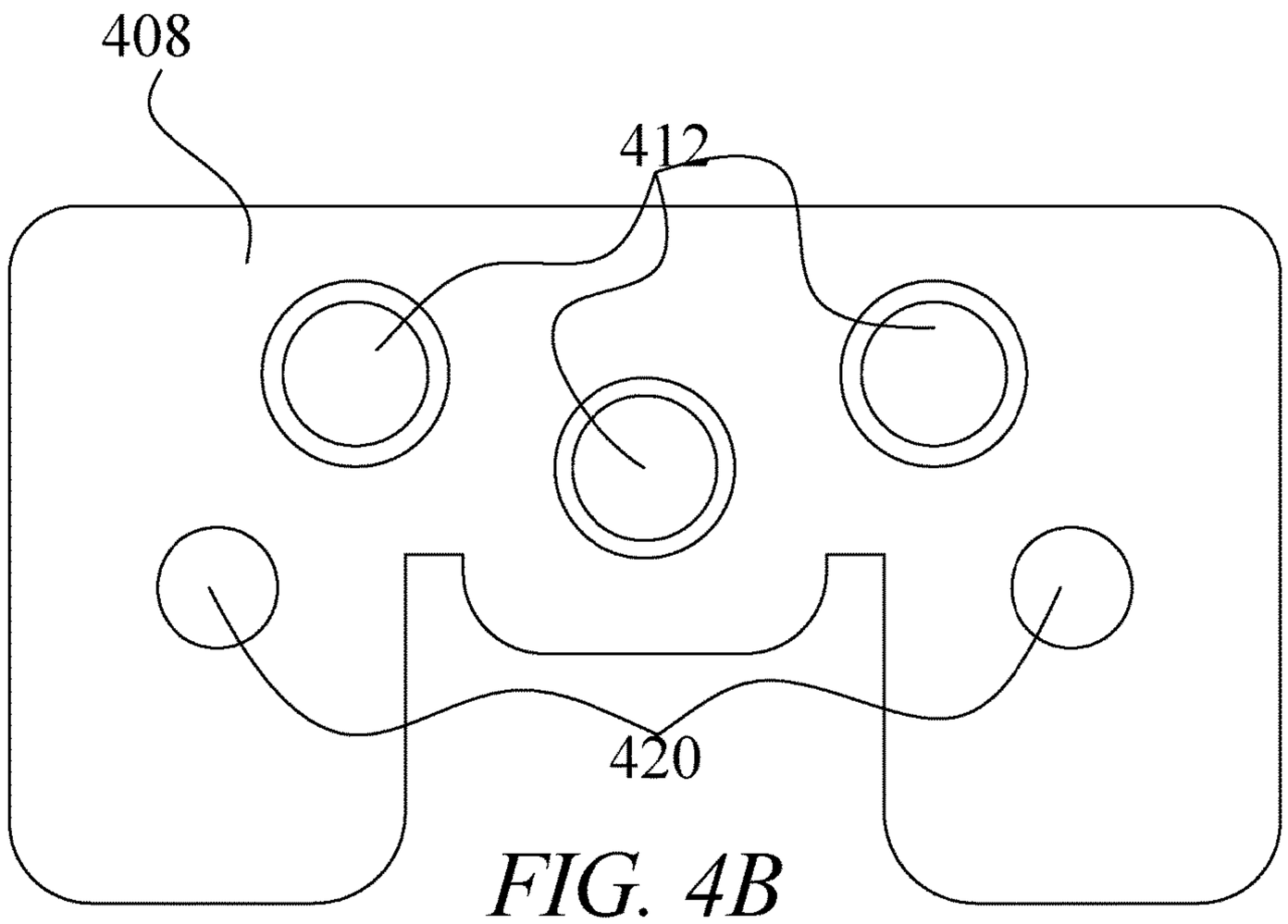

FIG. 4B

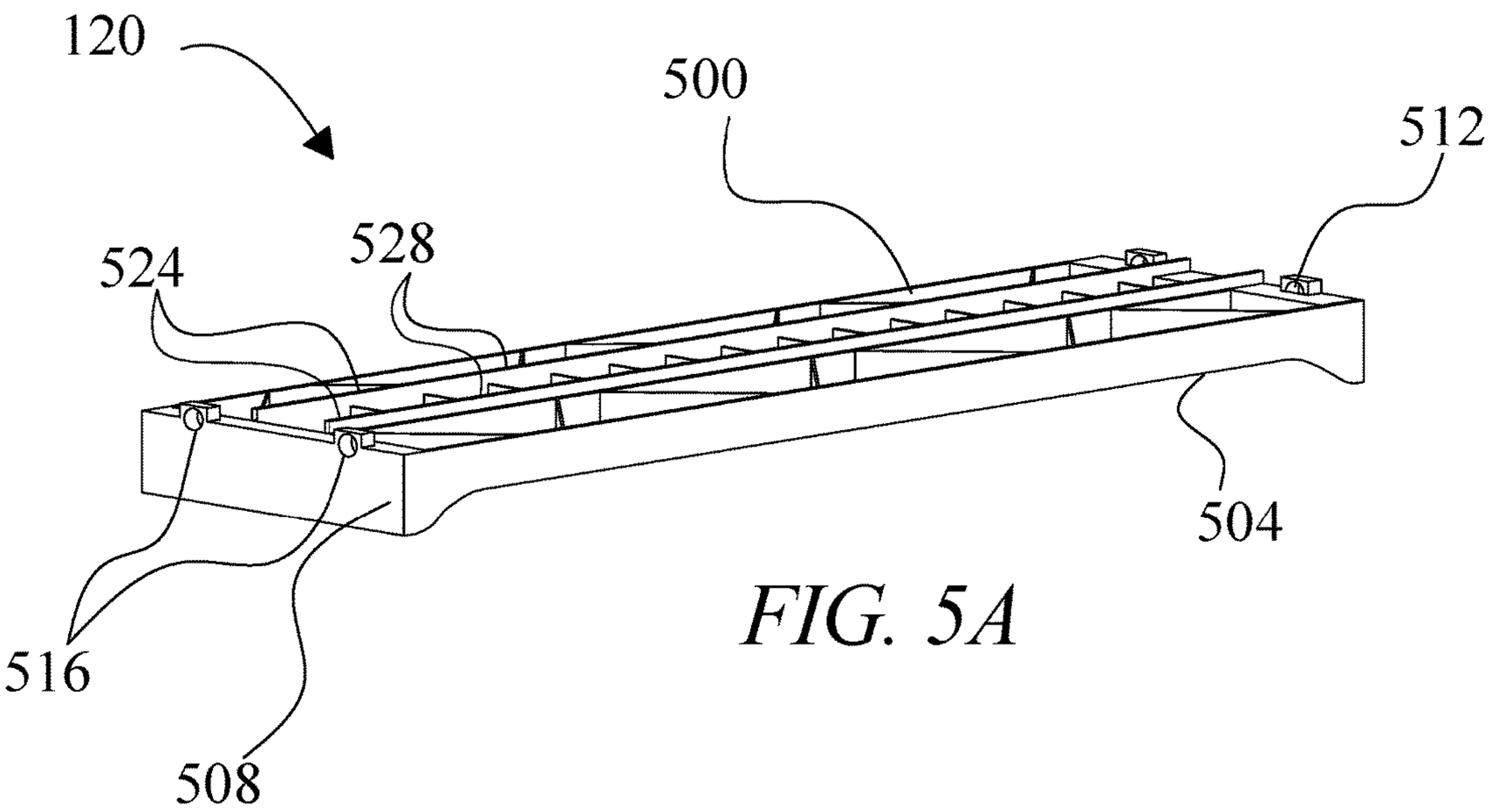

FIG. 5A

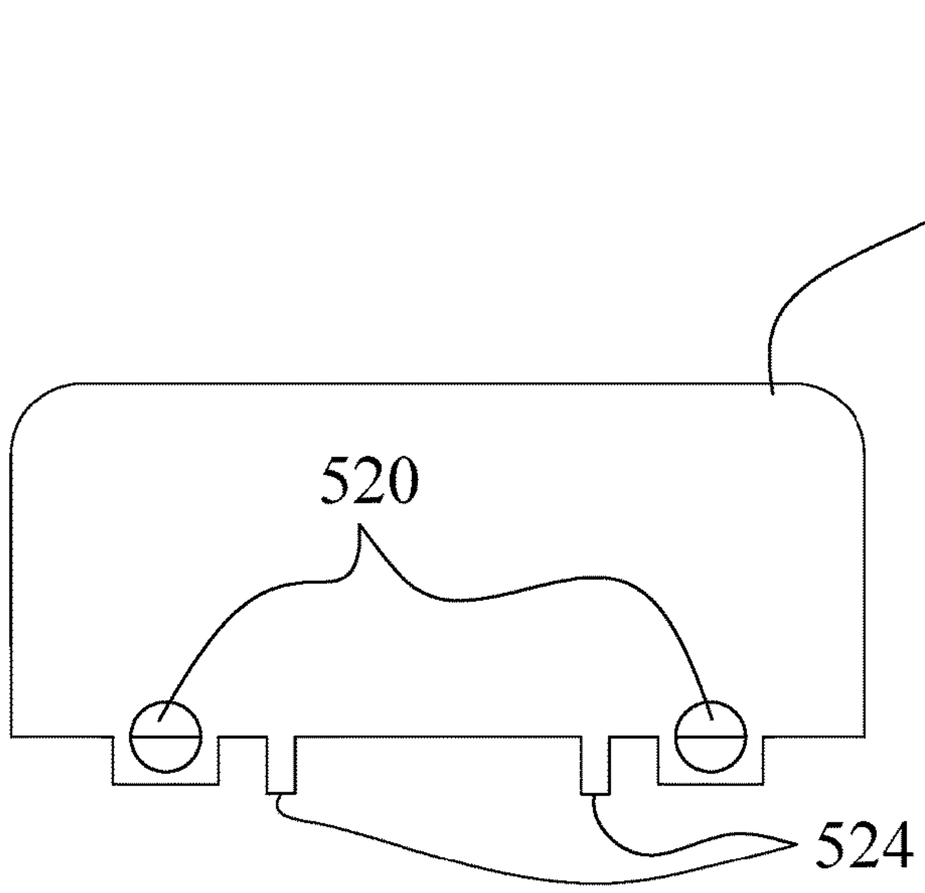

FIG. 5B

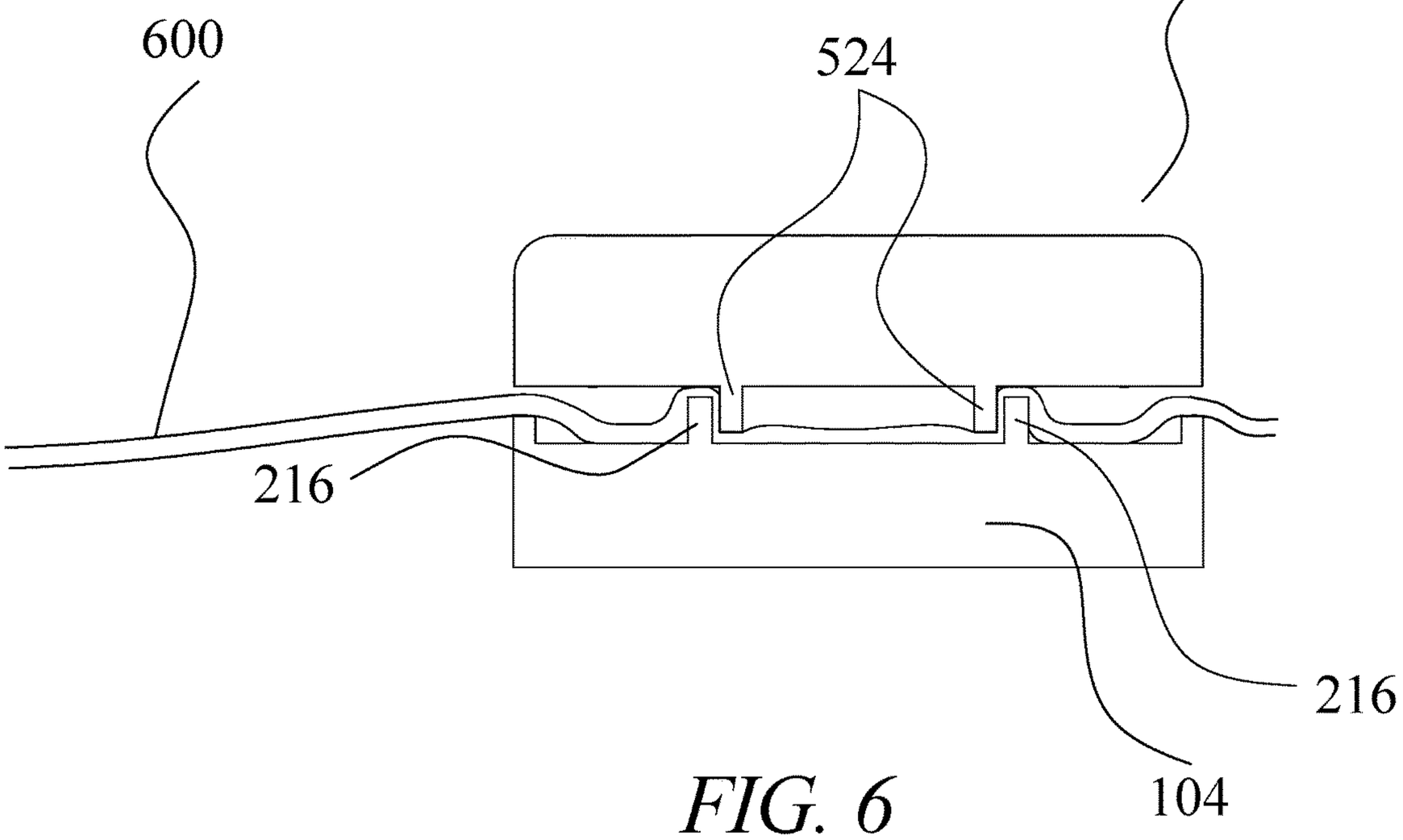

FIG. 6

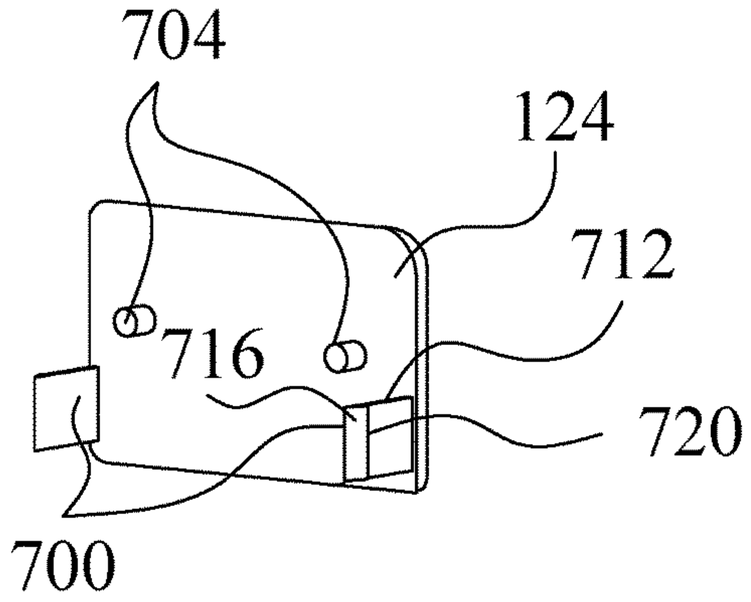

FIG. 7A

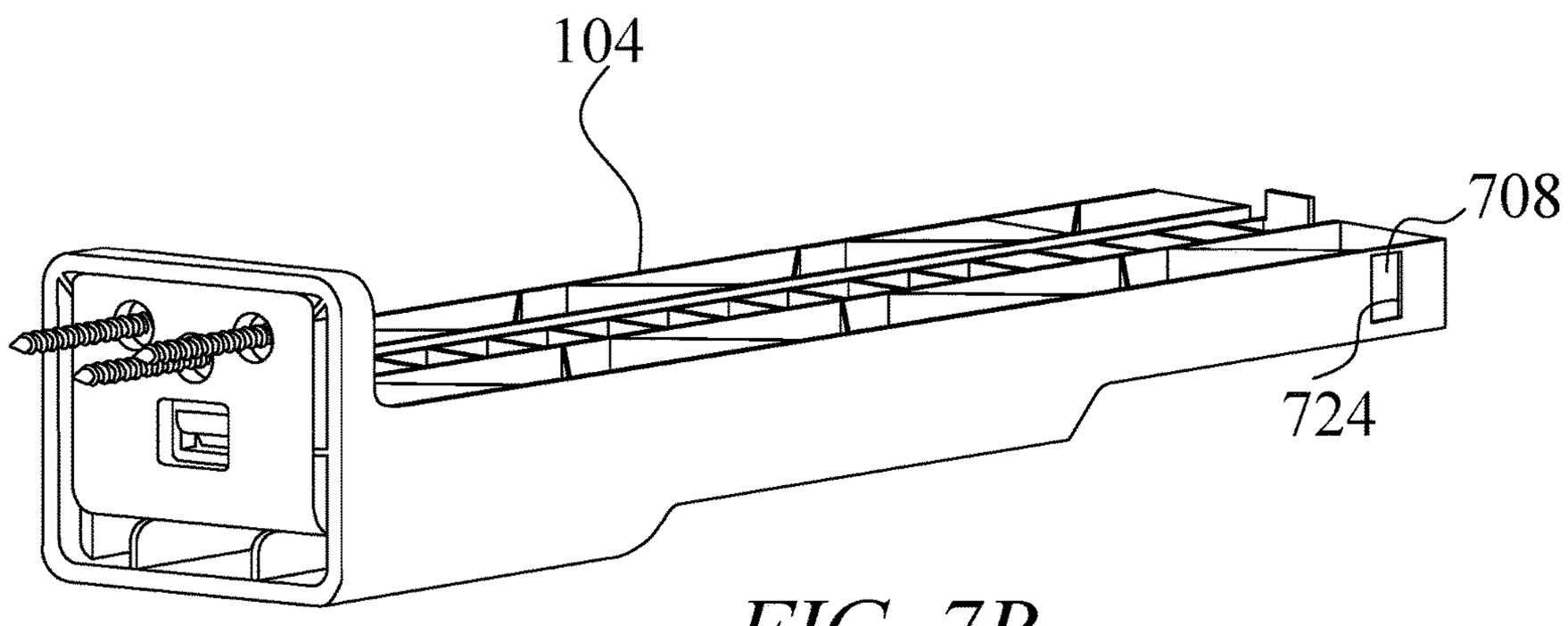

FIG. 7B

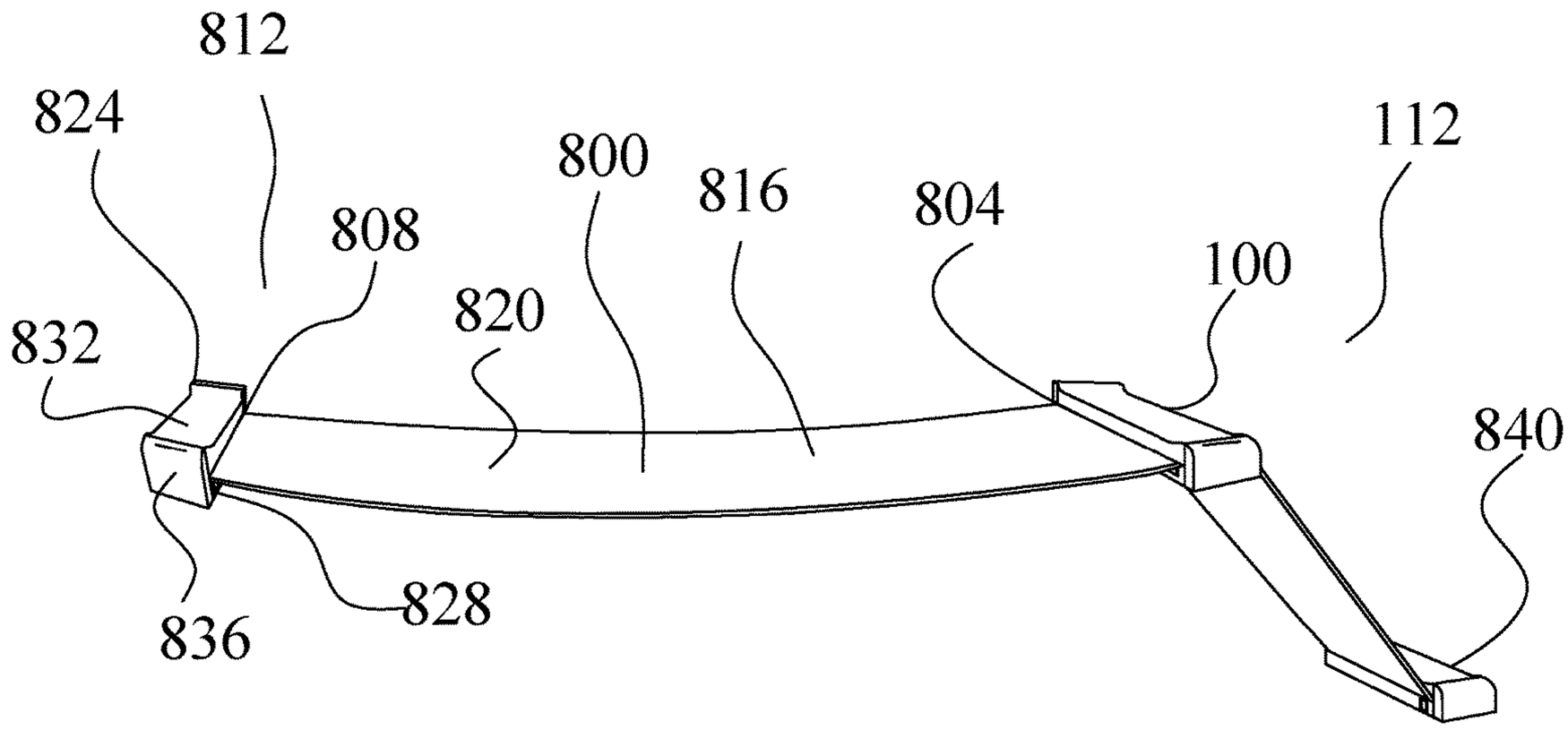

FIG. 8A

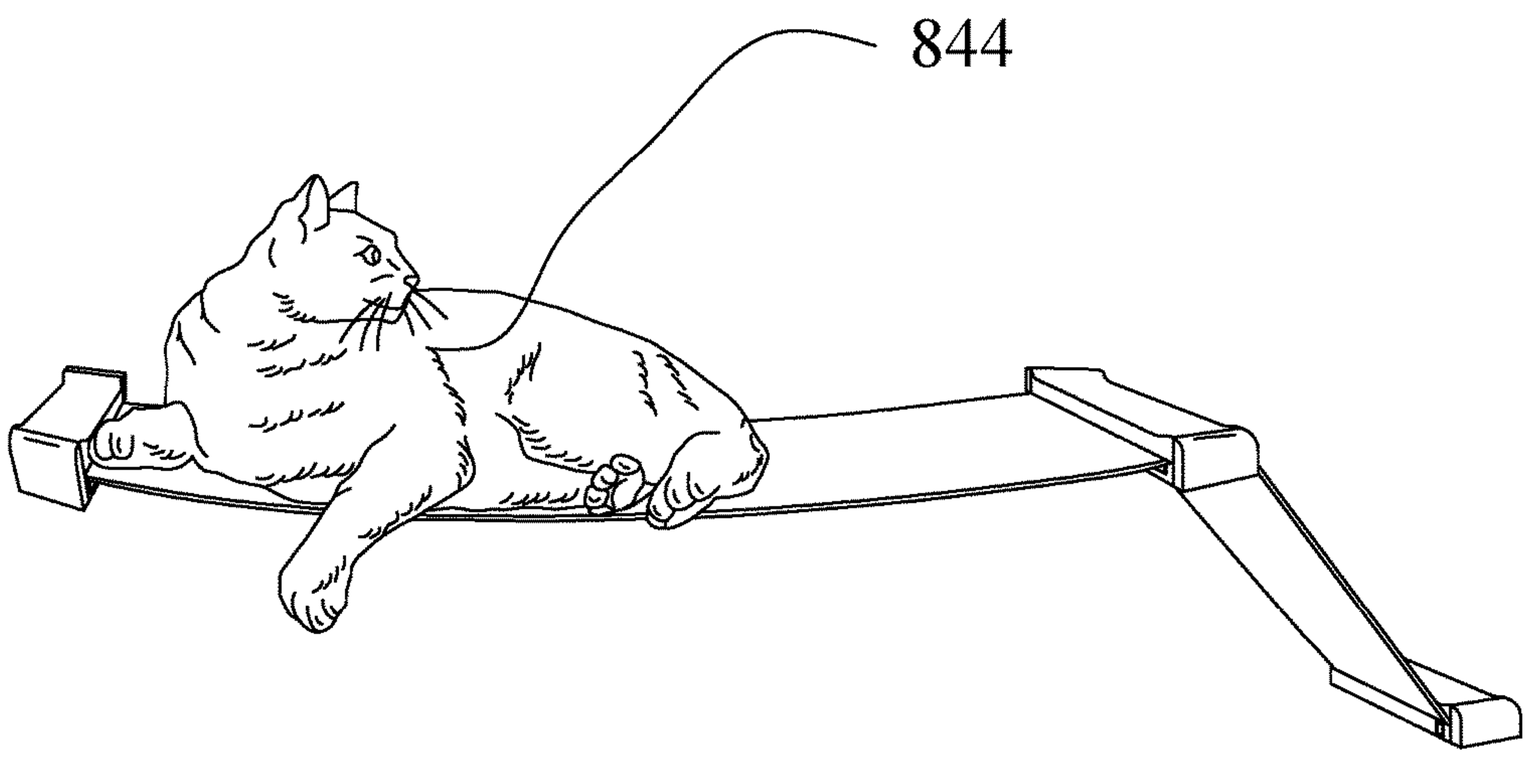

FIG. 8B

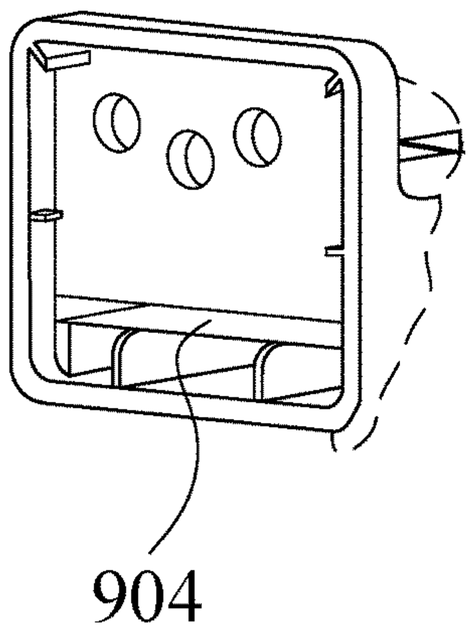

FIG. 9A

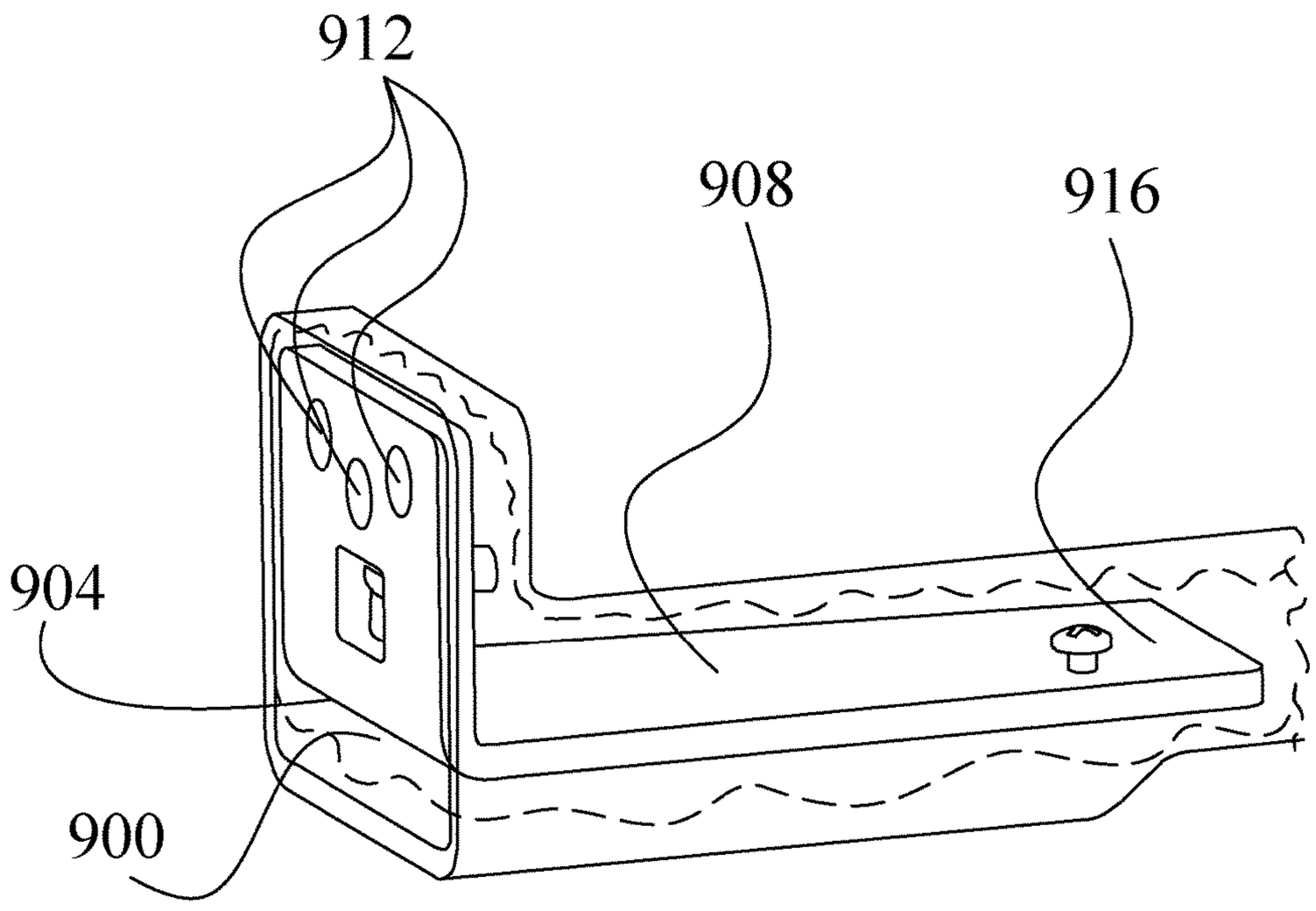

FIG. 9B

DEVICE FOR SECURING A PORTION OF A SHEET OF FLEXIBLE MATERIAL AND AN ITEM OF PET FURNITURE INCORPORATING THE DEVICE

The present invention generally relates to the field of furniture for pets. In particular, the present invention is directed to a device for securing a portion of a sheet of flexible material and an item of pet furniture incorporating the device.

BACKGROUND

Many pets respond well to being given habitual places to sleep or otherwise rest, for which purpose a number of pet furniture elements have been developed. Most pet furniture, however, lacks flexibility of deployment. Climbing structures, cots and floor-cushions take up too much space in many rooms. They can also give the rooms a cluttered appearance. For some pets, notoriously including cats, that prefer to rest on high surfaces, beds at floor level will be abandoned for higher ground of the pet's choosing like the backs of sofas or the tops of book-cases. This can result in messes, broken objects knocked off of shelves, and other undesirable outcomes.

SUMMARY OF THE DISCLOSURE

In one aspect, a device for securing a portion of a sheet of flexible material includes a first clamping element having a proximal end mounted to a first substantially vertical surface, a distal end, a first clamping surface orthogonal to the first substantially vertical surface, and a first opposite surface opposite to the first clamping surface. The device includes a second clamping element having a second clamping surface fitted against the first clamping surface and a second opposite surface opposite to the clamping surface. The device includes a first selectively engageable securing element that, when engaged, forces the second clamping surface to exert pressure against the first clamping surface. In an embodiment, a portion of a sheet of flexible material placed between the first clamping surface and the second clamping surface prior to securing the second clamping element to the first clamping element using the securing element is held there by the pressure exerted against the first clamping surface by the second clamping surface.

These and other aspects and features of non-limiting embodiments of the present invention will become apparent to those skilled in the art upon review of the following description of specific non-limiting embodiments of the invention in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of illustrating the invention, the drawings show aspects of one or more embodiments of the invention. However, it should be understood that the present invention is not limited to the precise arrangements and instrumentalities shown in the drawings, wherein:

FIG. **1** is an isometric view of an exemplary embodiment of a device;

FIG. **2** is an isometric view of an exemplary embodiment of a first clamping element;

FIGS. **3**A-B are isometric and schematic views of an exemplary use of an insert to secure an end of a flexible sheet of material in an embodiment;

FIG. **4**A is a partial view of an exemplary embodiment of a proximal end of a first clamping element;

FIG. **4**B is a schematic view of an exemplary embodiment of a brace plate;

FIGS. **5**A-B are isometric and schematic views of an exemplary embodiment of a second clamping element;

FIG. **6** is a schematic cross-section of an exemplary embodiment of a device with a sheet of flexible material inserted;

FIGS. **7**A-B are isometric views illustrating exemplary embodiments of mating features

FIGS. **8**A-B are perspective views of an exemplary embodiment of multiple devices with a flexible sheet installed on a vertical surface; and

FIGS. **9**A-B are perspective views of an exemplary embodiment of a mounting slot and mounting bracket.

DETAILED DESCRIPTION

In an embodiment, this disclosure describes devices that may be mounted to a wall or other upright structure to support beds, ramps, or walkways of material, including without limitation flexible material such as canvas. The devices are readily attached and detached, and secure ends or other portions of the flexible material by clamping, without the need to pierce the material with screws or fit the material with grommets. The devices allow the material to be adjusted to modify the slack or tension of a given section of material, allowing a user to create play structures, beds, hammocks, and other arrangements, which may be mounted high off the floor for the comfort and amusement of animals of an arboreal bent. A rapid-mounting system using brackets allows the devices to be moved quickly from one location to another on the wall while remaining secure when attached. As a result, users have great flexibility outfitting an otherwise unused portion of their living space with pet furniture, while having the option to modify or remove the furniture for parties or other events.

Turning now to FIG. **1**, an exemplary embodiment of a device **100** for securing a portion of a sheet of material is illustrated. The device **100** includes a first clamping element **104**. First clamping element **104** may be constructed of any suitable material or combination of materials having sufficient rigidity to perform clamping as described and illustrated hereinbelow. Materials making up first clamping element **104** may include, without limitation, plant materials such as wood or bamboo, metal, polymer materials such as plastic, composite materials such as fiberglass, ceramics, glass, or any combination thereof; materials may include materials that are flexible or elastomeric, in addition to any materials or combination of materials lending rigidity to first clamping element **104**.

Still viewing FIG. **1**, first clamping element **104** has a proximal end **108** mounted to a first substantially vertical surface **112**. First substantially vertical surface **112** may include, as a non-limiting example, an interior or exterior wall, an interior or exterior door, a doorframe, a piece of molding or other architectural element of an interior or exterior of a building, a surface of an item of furniture such as a shelving unit, chair, table, or other item, a portion of a ceiling such as a substantially vertical section of a domed or Mansard roof ceiling, a substantially vertical projection from a ceiling, a rafter or cross-beam, a stand such as a "hobby horse" or other item designed to support other objects, whether specially constructed to support device **100** or adapted for such support. First substantially vertical surface **112** may be substantially vertical only in the local-

ized area to which proximal end **108** attaches; that is, first substantially vertical surface **112** may include a surface that is vertical, or nearly vertical, only where attachment means of proximal end and/or bracing means as described in further detail below attach to first substantially vertical surface **112**. "Nearly vertical," as used herein, includes any surfaces that can be locally treated as essentially vertical; for instance, if a mounting slot and brace are used as described in further detail below, a surface is nearly vertical locally, and therefore substantially vertical as used herein, if the mounting slot and brace may contact the surface at points that may be located on an apparently vertical plane from a user's perspective, regardless of surface forms between those points. First clamping element **104** has a distal end **116**.

Turning now to FIG. **2**, first clamping element **104** may have solid or hollow construction. In some embodiments, first clamping element **104** includes a set of one or more internal voids to add lightness to first clamping element **104**; this may, for instance, reduce weight on the attachment of proximal end **108** to substantially vertical surface **112**. First clamping element **104** may include one or more internal bracing elements, such as triangular bracing made up of sheets or walls of rigid material. Bracing elements and voids may form any suitable configuration, including without limitation honeycomb construction. Bracing elements may include elements that extend to contact or brace against a mounting bracket as described in further detail below; for instance, one or more bracing elements may project from side-walls of a recess containing a vertical portion of the mounting bracket to hold the mounting bracket securely in place within the recess without filling the space around mounting bracket with material. Such bracing may increase structural strength of first clamping element **104** while retaining lightness of construction introduced by one or more voids.

Continuing to refer to FIG. **2**, first clamping element **104** includes a first clamping surface **200**. Still referring to FIG. **1**, first clamping element **104** has a first opposite surface **204** opposite first clamping surface **200**. First opposite surface **204** is located on an opposite side of first clamping surface; in other words, if first clamping surface **200** is considered a top side of first clamping element **104**, first opposite surface **204** may be considered an underside of first clamping element **204**. Force applied against the first opposite surface **204** may tend to urge the first clamping surface **200** in the direction in which first clamping surface **200** is facing. First clamping element **104** may include a bracing projection **208**. Bracing projection **208** may have a proximal end or surface at the first opposite surface **204** and a distal end **212** that braces against first substantially vertical surface **112** at a different location on first substantially vertical surface **112** from a location at which first clamping element **104** is attached to the first substantially vertical surface; for instance, distal end **212** may contact first substantially vertical surface **112** at a point below the point of attachment of proximal end **108**, creating a "triangular" bracing configuration. As a result, bracing projection **208** may have the effect of transferring a force exerted against first clamping surface **200** into first substantially vertical surface **112**. In an embodiment, this may enable device **100** to remain in position without substantially bending or breaking when a force is exerted against first clamping surface **200** by a weight on the device **100**. Device **100** may combine voids and internal bracing structures with bracing projection **208** to achieve a greater ability to support downward force such as that exerted by the weight of one or more animals such as cats or the like.

Still referring to FIG. **2**, first clamping surface **200** may include at least a projection **216**; "projection" is defined for the purposes of at least a first projection **216** as anything that extends upward from first clamping surface **200**, where the "surface" from which a projection **216** extends is taken as the lowest point of the surface given an "upward" direction away from the first clamping surface **200** and toward the second clamping element **120**, when the latter is engaged. As an example, where first clamping surface **200** is a flat plane with a groove, the portion of the first clamping surface **200** that is not the bottom of the groove is at least a first projection **216**, and the bottom of the groove is the surface from which the at least a first projection **216** projects. Similarly, where first clamping surface **200** includes a recess, at least a first projection **216** may be the portion of first clamping surface **200** that surrounds the recess. At least a first projection **216** may include at least a ridge extending in the direction from proximal end **108** to distal end **116**. At least a ridge may include a plurality of ridges running in parallel. For instance, and as a non-limiting example, at least a ridge may include two parallel ridges on either side of a centrally located groove or recess in first clamping surface **200**.

With continued reference to FIG. **2**, first clamping surface **200** may include at least a recess **220**; at least a recess **220** may have at least a projection **216** on one or both sides, as noted above. At least a recess **220** may have a substantially elongate shape, and may run along an axis from proximal end **108** to distal end **112**. Device **100** may include an insert **224**. Insert **224** may be selectively securable within at least a recess **220**; that is, insert **224** may be removable from recess, and may be secured within recess by a fastener or the like. For instance, and without limitation, insert **224** may have a first mating element **228** at a proximal end **232** of insert **224** that engages a corresponding mating element **236** of first clamping element **104**; insert **224** may have a second mating element **240** at a distal end **244** of insert **224** that engages a corresponding mating element **248** of first clamping element **104**. As a non-limiting example, first mating element **228** may include a projection that enters into a recess or hole that makes up corresponding mating element **236**, while second mating element **240** may include a latch or similar item that connects to corresponding mating element **248**, snapping insert **224** into place; the roles of the two mating elements may be reversed. Alternatively or additionally, either end of insert **224** may be secured in recess using any suitable fastener including screws, studs, locking studs, bolts with or without nuts, and the like. In an embodiment, as shown for instance in FIGS. **3**A-B, a portion of a sheet of flexible material **300**, such as an end of the sheet of flexible material **300**, may be placed in recess **220**, and insert **224** may be installed on top of sheet of flexible material **300**. Consequently, sheet of flexible material **300** may be secured to clamping surface **200** by insert **224**. This may, for instance, aid in securing an end of sheet of flexible material **300**; securing end of sheet of flexible material may be further aided by clamping using second clamping element as set forth in further detail below. In an embodiment, use of insert to secure an end of sheet of flexible material may enable a person operating device **100** alone to place end on first clamping surface **200** and proceed to clamp with second clamping element as described in further detail below, without having to hold the end of the sheet of flexible material in place with the user's hand.

Referring now to FIG. **4**, first clamping element **104** may include an end surface **400** located at the proximal end **108** and facing the distal end **116**. End surface **400** may be

substantially orthogonal to first clamping surface **200**; end surface **400** may combine with first clamping surface **200** to form a substantially "L"-shaped combined surface, with the end surface **200** approximately parallel to the first substantially vertical surface **112**. End surface **400** may form a shallow angle with first substantially vertical surface **112**. End surface may be substantially flat or may have any three-dimensional form; end surface **400** may have any combination of polygonal or curved forms for its peripheral edge. End surface **400** may include a recess **404**. Recess **404** may open in the direction of distal end **116**. Recess **404** may have any shape; in an embodiment recess **404** may be a mating element as described in further detail below, for instance by admitting a projection of a second clamping element.

With continued reference to FIGS. **4**A-B, device **100** may include a fastener brace plate **408** against end surface **400**. Fastener brace plate **408** may be inserted in recess **404**. Fastener brace plate **408** may be constructed of any suitable material, including without limitation metal. Fastener brace plate **408** may include at least a hole **412** to accept at least a fastener attaching proximal end **108** to first substantially vertical surface **112**. At least a hole **412** may include a plurality of holes. At least a hole **412** may include beveling to allow at least a fastener to be inserted flush into at least a hole; for instance, where the at least a fastener includes one or more screws, the at least a hole may include beveling to admit flat screw heads so the exposed screw head surfaces may be substantially flush with a surface of fastener brace plate **408**. In an embodiment, fastener brace plate **408** acts to distribute force exerted by fasteners across end surface **400**, adding to strength and durability of device **100**. Fastener brace plate **408** may include one or more additional holes through which projections may extend either toward or away from end surface **400**.

Still referring to FIGS. **4**A-B, device **100** may include at least a first mating feature **420** at proximal end **108**. At least a first mating feature **420** may be part of end surface **400**, fastener brace plate **408**, and/or a mounting bracket as described in further detail below. At least a first mating feature **420** may include recess **404**. At least a first mating feature **420** may include any component of any latching or fastening apparatus; at least a first mating feature **420** may latch or fasten to a corresponding mating feature of a second clamping element as described in further detail below. At least a first mating feature **420** may form a mortise-and-tenon combination with a corresponding mating feature of a second clamping element; the mortise-and-tenon combination may include at least a projection and/or recess in at least a first mating feature **420** that is inserted into and/or penetrated by a corresponding recess and/or projection in a corresponding mating element. As a non-limiting example, at least a first mating feature **420** may include at least a projection, which may be cylindrical or have any other suitable form. At least a projection may project from end surface **400**, fastener brace plate **408**, and/or a mounting bracket as described in further detail below; for instance, at least a projection may pass through one or more additional holes **416** in fastener brace plate **408** and/or one or more holes in end surface **400**. At least a projection may include at least two projections symmetrically arranged about a longitudinal axis of symmetry of first clamping surface **200**.

Referring again to FIG. **2**, first clamping surface **200** may be orthogonal to the first substantially vertical surface. As used herein, first clamping surface **200** is orthogonal to first substantially vertical surface **108** where first clamping surface **200** appears to be orthogonal or substantially orthogonal to the first substantially vertical surface **108**. First clamping surface **200** may be approximately planar; first clamping surface may have one or more surface irregularities or projections as described in further detail below. First clamping surface **200** may be essentially horizontal, or may be rotated from the horizontal to any degree. Although first clamping surface **200** is shown in FIG. **2** as substantially planar and substantially rectangular, first clamping surface **200** may have any suitable form; first clamping surface **200** may have any combination of polygonal and curved forms for its exterior perimeter, and any curved, angled or other three-dimensional structure on first clamping surface **200** itself.

With continued reference to FIG. **2**, first clamping element **104** may include a lip (not shown) that projects from first clamping surface **200** at distal end **116**. Lip may be substantially orthogonal to first clamping surface **200**. In an embodiment, lip may help to secure a second clamping element to first clamping surface, as set forth in further detail below. Furthermore, and as disclosed in further detail below, lip may aid in preventing a sheet of flexible material secured against first clamping surface **200** from sliding out from first clamping surface **200**. Alternatively or additionally, where securing element includes an end-cap as described in further detail below, securing element may aid in preventing a sheet of flexible material secured against first clamping surface **200** from sliding out from first clamping surface **200**.

Referring again to FIG. **1**, device **100** includes a second clamping element **120**. Second clamping element **120** may attach to first clamping element **104** to secure a portion of a sheet of flexible or other material, as set forth in further detail below. Second clamping element **120** may be composed of any material or combination of materials suitable for the composition of first clamping element **104**; second clamping element may include one or more voids and/or bracing elements as described above for first clamping element

Referring now to FIGS. **5**A-B, an exemplary embodiment of second clamping element **120** is illustrated. Second clamping element **120** includes a second clamping surface **500** that fits against first clamping surface **200**. Second clamping surface **500** may have any form suitable for the form of first clamping surface **200** as described above. Second clamping surface **500** may have a complementary form to first clamping surface **200**; in other words, second clamping surface **500** may include surface features that fit snugly against surface features of first clamping surface **200**. Second clamping element **120** includes a second opposite surface **504**; second opposite surface **504** is opposite the second clamping surface **500**, where "opposite" has the meaning described above regarding first opposite surface **204**.

Still referring to FIGS. **5**A-B, where first clamping element **104** includes an end surface **400**, second clamping element **120** may have a first end **508** that fits against end surface **400**. First end **508** may be shaped to fit against end surface **400** by having a complementary form to end surface **400**. For instance, where end surface **400** includes a recess **404**, first end **508** may include a projection that fits in recess; insertion of projection in recess may help secure second clamping surface **500** against first clamping surface **200**. Second clamping element **120** may have a second end **512**. Where first clamping element **104** includes a lip, second end **512** may fit against lip; for instance, the second end **512** may include a notch that fits over the lip.

Continuing to refer to FIGS. **5**A-B, where end surface **400** includes at least a first mating feature **420** as described

above, first end **508** may include at least a second mating feature **516** that mates with the at least a first mating feature **420**, securing the first end **508** against the end surface **400**. At least a second mating feature **516** may include any mating feature suitable for use as at least a first mating feature **420**, including without limitation any complementary fastener portion that may fasten to at least a first mating feature **420** and any projection and/or recess of a mortise-and-tenon combination. For example, and without limitation, at least a second mating feature **516** may include one or more recesses into which one or more projections of at least a first mating feature **420** may insert. Placement of at least a second mating feature **516** may be such that when mated with at least a first mating feature **420**, it tends to urge second clamping surface **500** tightly against first clamping surface. Second end **512** may also include at least a mating feature **520**, which may be any mating feature suitable for use as at least a second mating feature **516**.

With continued reference to FIGS. **5**A-B, second clamping surface **500** may include at least a second projection **524**. At least a second projection **524** may have any form suitable for use as at least a first projection **216** as described and defined above. At least a second projection **524** may include at least a ridge **528** extending in the same direction as at least a ridge **504**; that is, at least a ridge **528** may extend from first end **508** to second end **512**, and thus from proximal end **108** to distal end **116** when second clamping element **120** is engaged to first clamping element **104**. As a non-limiting example, at least a projection may include two parallel ridges that insert between two parallel ridges on first clamping surface **200**; ridges of first clamping surface **200** may alternatively fit between ridges on second clamping surface **500**.

Referring now to FIG. **6**, at least a second projection **524** may interlock with at least a first projection **216**. In an embodiment, at least a second projection **524** interlocks with at least a first projection **216** where a distal point **600** of the at least second projection **524** is closer to the first clamping surface **200** than a distal point **604** of the first projection **216**, when the two surfaces are engaged with no object inserted between the first clamping surface **200** and second clamping surface **500**. As shown for instance in FIG. **6**, which is a cross-sectional view of a non-limiting exemplary embodiment of device **100**, where at least a first projection **216** includes at least a ridge as described above, and at least a second projection **524** includes at least a ridge **528** as described above, the at least a first projection **216** and at least a second projection **524** may form a set of interlocking teeth. Where a portion **608** of a sheet **612** of flexible material is inserted between first clamping surface **200** and second clamping surface **500**, interlocking at least a first projection **216** and at least a second projection **524** may grip the portion **608**; the portion **608** may be bent in two or more directions by interlocking projections **216**, **600**, increasing the frictional resistance of the grip on at least a portion **608**, and as a result aiding in securing sheet **612** to device **100**. Where, as illustrated in a non-limiting example in FIG. **6**, there are four ridges, two on first clamping element **104** and two on second clamping element **120**, grip may be enhanced by the creation of two separate pinch points securing flexible material. Where sheet of material is not flexible, such pinch points may still aid in securing sheet of material by augmenting pressure and thus friction forces securing material in place.

Referring again to FIG. **1**, device **100** includes a first selectively engageable securing element **124**. First selectively engageable securing element **124** may be any element that, when engaged, forces the second clamping surface **500** to exert pressure against the first clamping surface **200**. As used herein, "selectively engageable" means that element **124** may be secured to both first clamping element **104** and second clamping element **120** to secure the first and second clamping elements together, and may be disengaged by a user to permit the first and second clamping elements to be wholly or partially separated; engagement and disengagement may be performed repeatedly by a user without appreciable damage to first clamping element **104**, second clamping element **120**, and/or selectively engageable securing element **124**. This may be accomplished by a first selectively engageable securing element **124** exerting force second opposite surface **504**, forcing second clamping surface **500** against first clamping surface **200**. First selectively engageable securing element **124** may include, without limitation, a bracket having a first surface secured to first substantially vertical surface **112** and a second surface pressed against the second opposite surface **504**. First surface may be secured to first substantially vertical surface **112** by any means or combination of means usable for securing mounting bracket, as described below, to first substantially vertical surface **112**. First selectively engageable securing element **124** may include a clamp, such as a C-clamp or the like, attached to first clamping element **104**, which may be tightened against a portion of second opposite surface **504**.

Referring now to FIGS. **7**A-B, and with further reference to FIGS. **1-2** and **4**B, securing device **124** may include at least a third mating feature **700** that engages first clamping element **104**. At least a third mating feature **700** may include any mating feature suitable for use as at least a first mating feature **420** as described above. At least a third mating feature **700** may, as a non-limiting example, connect to distal end **116** of first clamping element **104**. Securing device **124** may include at least a fourth mating feature **704** that engages the second clamping element; at least a fourth mating feature **704** may include any mating feature suitable for use as at least a first mating feature **420** as described above. Fourth mating feature **704** may connect to second end **512** of second clamping element **120**. First clamping element **104** may include at least a fifth mating feature **708** that engages the at least a third mating feature. At least a fifth mating feature **708** may include any mating element suitable for use as at least a first mating element **420** as described above. Second clamping element **120** may further include at least a sixth mating feature that engages the at least a fourth mating feature **704**; at least a sixth mating feature may include, without limitation additional mating feature **520** as described above. At least a sixth mating feature may include mating feature suitable for use as at least a first mating feature **420** as described above. In an embodiment, at least one of at least a feature of the at least a third mating feature, at least a fourth mating feature, at least a fifth mating feature, and at least a sixth mating feature further comprises a locking feature **712** that secures the at least a feature when engaged to a corresponding feature of the at least a third mating feature, at least a fourth mating feature, at least a fifth mating feature, and at least a sixth mating feature. A locking feature, as used herein, is a feature that prevents disengagement of coupled mating features; for instance, where coupled mating features are complementary portions of a latch, the element of the latch that latches them together is a locking feature. A locking feature **712** may further be characterized as a mating feature that will not uncouple from a corresponding mating feature unless subjected to a separate act by a user from slidable retraction of securing device from remainder of device **100**. As a further non-limiting

illustration, a locking feature **712** may include a slide-release mechanism, such as found in a slide-release buckle, in which a cam surface **716** is forced against some portion of a corresponding mating feature, causing elastic deformation of the locking feature **712**; the elastic deformation of the locking feature in turn creates a recoil force, such as a spring force as approximated by Hooke's law, which urges a projection **720** into a space **724** in a corresponding mating feature, where the projection **720** prevents sliding retraction of locking feature **712** by engagement of a surface **728** against which it exerts a force opposite a direction of motion to retract the locking feature **712**. Continuing the non-limiting example, as a result the locking feature **712** may not be retracted unless a force normal to the retraction path causes further elastic deformation of locking feature **712** to remove projection **720** from space **724**, allowing it to bypass surface **728** so that locking feature **712** may be retracted. Persons skilled in the art will be aware, upon reading the entirety of this disclosure, of many forms acceptable for use as locking features **712**, as defined and illustrated herein. In non-limiting example, at least a third mating feature **700** may include a locking feature **712** that locks when coupled to at least a fifth mating feature **708**; there may be a pair of such features disposed on sidewalls of device **100** near to distal end **116**, requiring, for instance, disengagement of two locking features by pressing in on two slide-release projections **720**. Further continuing the non-limiting example, at least a fourth mating feature **704** may form a mortise-and-tenon pair with at least a sixth mating feature, for instance by including at least a projection that penetrates at least a recess in second end **512**.

As illustrated for instance in FIG. **1**, securing device **124** may form an end-cap that holds second end **512** against distal end **116**; where first end **508** is secured at proximal end **108** as described above, second clamping surface **500** may be pressed against first clamping surface **200**. Where securing device **124**, whatever its form, is engaged, and a portion of a sheet of flexible material is placed between first clamping surface **200** and second clamping surface **500** prior to securing second clamping element **120** to first clamping element **104** using the securing element **124**, portion may be held there by the pressure exerted against the first clamping surface by the second clamping surface.

FIGS. **8**A-B illustrate an exemplary embodiment in which a sheet of flexible material **800** is so secured. Sheet of flexible material **800** may be formed from any flexible material or combination of materials, including without limitation sheets of polymer material such as rubber, sheets of textile material such as canvas, sheets of natural material such as rubber, or any combinations thereof in layers and/or other mixtures. Sheet of flexible material **800** may include a first portion **804** inserted between first clamping surface **200** and second clamping surface **500**, for instance as described above. A second portion **808** of sheet of flexible material **800** may be secured to a second substantially vertical surface **812**; second substantially vertical surface **812** may be anything suitable for use as first substantially vertical surface **112**. Second substantially vertical surface **812** may be a part of first substantially vertical surface **112**, part of a structure including first substantially vertical surface, or may be a part of a separate structure. For instance, where first substantially vertical surface **112** is a part of a wall, second substantially vertical surface may be part of that wall, an opposite wall, a bookshelf or other furniture item near to the wall, an architectural feature near to the wall, or any other substantially vertical surface as described above. Sheet of flexible material **800** may include a third portion **816** between first portion **804** and second portion **808**. Third portion **816** may include an upper surface **820** substantially orthogonal to first substantially vertical surface **112**; upper surface **820** may be substantially orthogonal to first substantially vertical surface **112** where at least one line substantially orthogonal to first substantially vertical surface **112** may be drawn across upper surface **820**. Upper surface **820** may not be entirely orthogonal to first substantially vertical surface **112**; for instance, where second portion **808** is close enough to first portion **804** to allow third portion **816** to hang down like a bag or hammock, upper surface **820** may be bowed or otherwise curved. Third portion **816** may be stretched taught or may be given any degree of slack as desired. Second portion **808** may be disposed above, below, or on the same vertical level as first portion **804**, permitting third portion **816** to have the form of a level walkway or ramp.

Still referring to FIGS. **8**A-B, second portion **808** may be secured to second substantially vertical surface **812** using another device **824** having the features of device **100**. In other words, device **100** may include a third clamping element **828** having a proximal end mounted to the second substantially vertical surface **812** a distal end, a third clamping surface orthogonal to the substantially vertical surface, and a third opposite surface opposite to the first clamping surface; each of the proximal end, distal end, third clamping surface, and third opposite surface may be implemented as described and depicted above. Device **100** may include a fourth clamping element **832** which may have a fourth clamping surface fitted against the third clamping surface and a fourth opposite surface opposite to the fourth clamping surface, each of which may be implemented as described and illustrated above. Device **100** may include a second selectively engageable securing element **836**, which may exert force against the opposite surface of the fourth clamping element when engaged, forcing the fourth clamping surface to exert pressure against the third clamping surface, as described and illustrated above. One or more additional devices **840**, which may be implemented as described for device **100**, may also be included, and may attach to one or more additional portions of sheet **800**, with intermediate portions of sheet **800** providing additional upper surfaces which may be arranged in any manner suitable for third portion **816**.

In operation, as shown for instance in FIG. **8**B, device **100** may function as an item of furniture for an animal **844** such as a cat. A user may install one or more devices with flexible sheets stretched between them at varying angles and degrees of tension, creating walkways, ramps, hammocks, and/or beds for the animal **844** as desired; user may modify the configuration by detaching one or more distal ends, for instance by removal of a mounting bracket tab from mounting slot, and reattaching to another location, for instance using a different mounting bracket. Furthermore, the user may disengage any portion of sheet from any device by separating first and second clamping elements after disengaging securing element; sheet may then be removed, or pulled in one or another direction to adjust the tension on sheet. The entire structure may be removed by detaching distal ends from substantially vertical surface; this may enable relocation to another room or wall, or storage during a social engagement or other event requiring the removal of device **100** and flexible sheet. Once removed, device **100** (or devices) and flexible sheet or sheets may be stored compactly until further use.

It should be noted that, although in FIGS. **8**A-B the sheet of material is depicted and described as wholly flexible, portions of sheet of material may alternatively be rigid; sheet

of material may, for instance, include one or more sheets of stiff or inflexible material, which may be constructed of any material or combination of materials suitable for construction of first clamping element **104**, and which may be connected to one or more portions of flexible material as described above. In other embodiments, sheet is entirely stiff, and is clamped by device **100** or devices to form a rigid platform or ramp.

Turning now to FIGS. **9**A-B, device **100** may include at least a mounting aperture **900** in first clamping element **104** at proximal end. At least a mounting aperture **900** may be an aperture at or in a portion of distal end **116**. At least a mounting aperture **900** may include, without limitation one or more holes through which screws, nails, bolts, or other fasteners may be inserted. At least a mounting aperture **900** may include one or more openings into which a fastener attached to first substantially vertical surface **112** may be inserted, such as keyhole slots or the like. In an embodiment, at least a mounting aperture **900** includes a mounting slot **904**. Mounting slot **904** may have an opening in distal end; mounting slot **904** may have an opening in an end surface **400**, or may only have an opening at distal end **116**. Although mounting slot **904** is shown here as having an elongate and substantially rectangular form, mounting slot **904** and/or at least a mounting aperture **900** may have any shape conducive to its use to secure first clamping element **104** to first substantially vertical surface **112**. In an embodiment, mounting slot **904** extends for some distance beneath first clamping surface **200**.

Still referring to FIGS. **9**A-B, device **100** may include a mounting bracket **908** that may be used to secure device **100** to first substantially vertical surface **112** is illustrated. Mounting bracket **908** and/or proximal end **108** may have an attachment means **912** for attaching mounting bracket **908** and/or proximal end **108** to first substantially vertical surface; attachment means **912** may include, without limitation, screw or bolt-holes with screws, bolts, or nails, adhesive to adhere mounting bracket **908** and/or proximal end **108** to first substantially vertical surface **112**, detachable surface fasteners such as pressure adhesive, hook-and-loop fasteners, a press fastener such as the DUAL LOCK fastener produced by 3M Company Co. of St. Paul, Minn., or any other fastener or attachment means for attaching an object to a first substantially vertical surface. Where attachment means **912** includes screw holes or the like, such screw holes may line up with similar holes in proximal end **108** and/or fastener brace plate **408**, allowing screws or similar fasteners to pass through all such holes and secure fastener brace plate **408**, proximal end **108** and/or mounting bracket **908** to substantially vertical surface **112** and to each other.

Mounting bracket **908** may include at least a projection **916** projecting away from first substantially vertical surface **112**. At least a projection **916** may be shaped to insert in at least a mounting aperture **900**; for instance, where at least a mounting aperture **900** includes a mounting slot, at least a projection **916** may include a tab that fits in at least a mounting slot. As a non-limiting example, first clamping element **104** may be mounted to first substantially vertical surface **112** by inserting at least a projection **916** in at least a mounting aperture **900**; for instance, tab may be inserted in mounting slot. In an embodiment, mounting bracket **908** may provide a way to rapidly mount or unmount first clamping element **104** and/or device **100**, allowing a user to customize positioning of first clamping element **104** and/or device **100** as desired. Mounting bracket **908** and at least a mounting aperture **900** may combine in some embodiments with bracing projection **208** to hold proximal end **108** securely against first substantially vertical surface **112**; bracing projection **208** and mounting bracket **908** may support weight of an object or animal placed on device **100** or objects attached thereto as descried in further detail below. Alternatively or additionally, proximal end **108** may be directly attached to first substantially vertical surface **112** using any means or combination of means suitable for attaching mounting bracket **908** to the first substantially vertical surface. As noted above, at least first mating feature **420** may include portion of or element attached to mounting bracket **908**; for instance, where at least a first mating feature **420** includes at least a projection, at least a projection may pass through holes in distal end **108** and/or fastener brace plate **408** to mate with a corresponding recess in first end **508** of second clamping element **120**.

The foregoing has been a detailed description of illustrative embodiments of the invention. Various modifications and additions can be made without departing from the spirit and scope of this invention. Features of each of the various embodiments described above may be combined with features of other described embodiments as appropriate in order to provide a multiplicity of feature combinations in associated new embodiments. Furthermore, while the foregoing describes a number of separate embodiments, what has been described herein is merely illustrative of the application of the principles of the present invention. Additionally, although particular methods herein may be illustrated and/or described as being performed in a specific order, the ordering is highly variable within ordinary skill to achieve methods, systems, and software according to the present disclosure. Accordingly, this description is meant to be taken only by way of example, and not to otherwise limit the scope of this invention.

Furthermore, the foregoing has been a detailed description of illustrative embodiments of the invention. It is noted that in the present specification and claims appended hereto, conjunctive language such as is used in the phrases "at least one of X, Y and Z" and "one or more of X, Y, and Z," unless specifically stated or indicated otherwise, shall be taken to mean that each item in the conjunctive list can be present in any number exclusive of every other item in the list or in any number in combination with any or all other item(s) in the conjunctive list, each of which may also be present in any number. Applying this general rule, the conjunctive phrases in the foregoing examples in which the conjunctive list consists of X, Y, and Z shall each encompass: one or more of X; one or more of Y; one or more of Z; one or more of X and one or more of Y; one or more of Y and one or more of Z; one or more of X and one or more of Z; and one or more of X, one or more of Y and one or more of Z.

Various modifications and additions can be made without departing from the spirit and scope of this invention. Features of each of the various embodiments described above may be combined with features of other described embodiments as appropriate in order to provide a multiplicity of feature combinations in associated new embodiments. Furthermore, while the foregoing describes a number of separate embodiments, what has been described herein is merely illustrative of the application of the principles of the present invention. Additionally, although particular methods herein may be illustrated and/or described as being performed in a specific order, the ordering is highly variable within ordinary skill to achieve aspects of the present disclosure. Accordingly, this description is meant to be taken only by way of example, and not to otherwise limit the scope of this invention.

Exemplary embodiments have been disclosed above and illustrated in the accompanying drawings. It will be understood by those skilled in the art that various changes, omissions and additions may be made to that which is specifically disclosed herein without departing from the spirit and scope of the present invention.

What is claimed is:

1. A device for securing a portion of a sheet of flexible material, the device comprising:

a first clamping element having a first proximal end mounted to a first substantially vertical surface, a first distal end, a first clamping surface orthogonal to the first substantially vertical surface, and a first opposite surface opposite to the first clamping surface, wherein the first distal end further comprises at least a first mating feature;

a second clamping element having a second clamping surface fitted against the first clamping surface and a second opposite surface opposite to the second clamping surface, the second clamping surface having a second proximal end and a second distal end, wherein the second distal end further comprises at least a second mating feature; and

a first selectively engageable securing element that, when engaged, forces the second clamping surface to exert pressure against the first clamping surface, wherein the first selectively engageable securing element further comprises:

an end-cap having a proximal surface that, when engaged, faces the first distal end and the second distal end, at least a first end-cap mating feature on the proximal surface that engages the first mating feature and at least a second end-cap mating feature on the proximal surface that engages the second mating feature;

whereby a portion of a sheet of flexible material placed between the first clamping surface and the second clamping surface prior to securing the second clamping element to the first clamping element using the securing element is held there by the pressure exerted against the first clamping surface by the second clamping surface.

2. The device of claim **1**, wherein the first clamping element further comprises an end surface located at the first proximal end and facing the first distal end.

3. The device of claim **2**, further comprising a fastener brace plate against the end surface, the fastener brace plate having at least a hole to accept a fastener attaching the first proximal end to the first substantially vertical surface.

4. The device of claim **2**, wherein the second proximal end fits against the end surface.

5. The device of claim **2**, wherein:

the end surface further comprises a first end-surface mating feature; and

the second proximal end further comprises a second proximal end mating feature that mates with the first end-surface mating feature, securing the second proximal end against the end surface.

6. The device of claim **5**, wherein at least one of the first end-surface mating feature and the second proximal end mating feature further comprises at least a projection and a corresponding at least one of the first end-surface mating feature and the second proximal end mating feature further comprises at least a recess, wherein the first end-surface mating feature and the second proximal end mating feature mates with the first end-surface mating feature by insertion of the at least a projection into the at least a recess.

7. The device of claim **1**, wherein the first clamping surface further comprises at least a first projection extending from the first clamping surface.

8. The device of claim **7**, wherein the at least a first projection further comprises at least a ridge.

9. The device of claim **7**, wherein the second clamping surface further comprises at least a second projection that interlocks with the at least a first projection.

10. The device of claim **1** further comprising a mounting slot in the proximal end of the first clamping element.

11. The device of claim **10** further comprising a mounting bracket having a projection that projects from the first substantially vertical surface, wherein the first clamping element is connected to the mounting bracket by inserting the projection in the mounting slot.

12. The device of claim **11** wherein the mounting bracket further comprises a first mating feature, and the second clamping element further comprises a first end having a second mating feature that mates with the first mating feature, securing the first end to the mounting bracket.

13. The device of claim **1**, wherein:

second distal end is adjacent to the first distal end when the securing device is engaged.

14. The device of claim **1** wherein:

at least one of the first mating feature and the first end-cap mating feature further comprises at least a first projection and a corresponding at least one of the first mating feature and the first end-cap mating feature further comprises at least a first recess, wherein the at least a first end-cap mating feature engages the at least a first mating feature by insertion of the at least a first projection into the at least a first recess; and

at least one of the second mating feature and the second end-cap mating feature further comprises at least a second projection and a corresponding at least one of the first mating feature and the first end-cap mating feature further comprises at least a second recess, wherein the at least a first end-cap mating feature engages the at least a first mating feature by insertion of the at least a first projection into the at least a first recess.

15. The device of claim **1**, wherein at least a feature of the at least a first end-cap mating feature, at least a second end-cap mating feature, at least a first mating feature, and at least a second mating feature further comprises a locking feature that secures the at least a feature when engaged to a corresponding feature of the at least a first end-cap mating feature, at least a second end-cap mating feature, at least a first mating feature, and at least a second mating feature.

16. The device of claim **1** further comprising the sheet of flexible material, wherein the sheet of flexible material includes a first portion inserted between the first clamping surface and the second clamping surface.

17. The device of claim **16**, wherein the sheet of flexible material further comprises a second portion secured to a second substantially vertical surface.

18. The device of claim **17**, wherein the sheet of flexible material further comprises a third portion having an upper surface substantially orthogonal to the first substantially vertical surface, wherein the third portion is between the first portion and the second portion.

19. The device of claim **17** further comprising:

a third clamping element having a proximal end mounted to a first substantially vertical surface, a distal end, a third clamping surface orthogonal to the first substantially vertical surface, and a third opposite surface opposite to the third clamping surface; and

a fourth clamping element having a fourth clamping surface fitted against the third clamping surface and a fourth opposite surface opposite to the clamping surface; and

a second selectively engageable securing element that, when engaged, forces the fourth clamping surface to exert pressure against the third clamping surface;

wherein the second portion of the sheet of flexible material is inserted between the third clamping surface and the fourth clamping surface.

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